Yaquina Head Seabird Colony Monitoring
2011 Season Summary

Robert Suryan
Oregon State University, Hatfield Marine Science Center,
Newport, Oregon, rob.suryan@oregonstate.edu, 541-867-0223

Cheryl Horton,
Department of Fisheries and Wildlife, Oregon State University, Newport, Oregon

Amanda Gladics
Marine Resource Management, College of Earth, Ocean and Atmospheric Sciences,
Oregon State University, Corvallis, Oregon

Alexandra Gulick
Marine Biology Program, College of Science, Oregon State University, Newport, Oregon

Laura Filliger
National Science Foundation, Research Experience for Undergraduate Intern
Hatfield Marine Science Center, Newport, Oregon
& Carnegie Mellon University, Pittsburg, Pennsylvania

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Project Overview

Yaquina Head Outstanding Natural Area (YHONA) is home to some of Oregons's largest and most publically visible seabird colonies, including over 60,000 Common Murres (*Uria aalge*). The seabird colonies surrounding Yaquina Head present a unique opportunity for research and monitoring given their close proximity to viewing platforms and intensive oceanographic studies of surrounding waters. Additionally, this is one of the most rapidly growing and productive murre colonies on the Oregon coast. YHONA seabird studies are a joint project among Oregon State University, U.S. Fish and Wildlife Service, and the Bureau of Land Management. Summer 2011 was the 5th consecutive year of study by these collaborators. Combined with similar studies conducted by Julia Parrish (University of Washington) at YHONA from 1998 to 2002, we are now developing a much needed time series investigation for the Oregon Coast (currently at 10 years). Unfortunately, no data were collected at YHONA from 2002-2006, a timeframe containing highly anomalous ocean conditions. With La Niña conditions in 2009, switching to El Niño conditions in 2010, and then switching back to La Niña into 2011, these have been interesting years to capture seabird responses to environmental variability on the central Oregon coast.

In general, we are interested in how seabird breeding chronology, reproductive success, diet, and foraging activities are affected by changing ocean conditions. Furthermore, we wish to quantify the effects of bald eagles and other sources of predation on or disturbance to seabirds during the breeding season. We monitored 12 plots on Colony Rock and Flattop Rock (Fig. 1) throughout the breeding season (April-August). Within these plots, we closely observed breeding birds (Fig. 2), watching and recording when eggs were laid and then following the success of each breeding pair through egg incubation and chick rearing. Simultaneously, we watched for disturbances to the breeding colony and recorded the frequency, duration, and consequences (e.g., loss of eggs or chicks) of these events. For prey identification, we used a digital camera and spotting scope (digiscoping; Fig. 3) to photograph fish in the bills of murres returning to the colony. This information allows us to analyze the birds' diet and provide information about foraging conditions and link to oceanographic investigations adjacent to these seabird colonies. We also conducted observations to estimate the time elapsed between chick feeding events, which can be used as a proxy for prey availability near the colony.

Results

In 2011 we logged 372 hours during 79 days of observations between 16 May (some eggs were already present) and 20 August (Table 1). Common Murre chicks were first observed on 28 June and **median hatch date was 8 July, similar to 2010, but two weeks later than the previous three years (2007-2009)**. Colony Rock and Flattop Rock were again synchronous in median hatch date. Among plots, only 36% ($\pm$ 0.07 SE, 0.00-0.79 range) of the eggs laid hatched a chick (hatching success) and 22% ($\pm$ 0.04 SE, 0.00-0.47 range) of the eggs laid produced chicks that fledged (reproductive success; chicks $\geq$ 15 days were considered fledged; Table 1). **Reproductive success in 2011was less than half of the previous 4 years (Table 1) and the second lowest recorded for this colony during 10 years of data collection**. Only the reproductive success during the very strong 1998 El Niño was slightly lower**.**

Much of the reproductive loss in 2011 was due to egg and chick predators. The total number of disturbances, the number of species causing disturbances, and the rate of murre, egg, and chick loss was much greater in 2011 than the previous 4 years (Table 1). **Bald eagles (*Haliaeetus leucocephalus*) were again the dominant disturbance source (72%, 133 of 186 disturbances) at YHONA** (Fig. 5). In 2011, there were more eagles causing disturbances, more regions of the colony disrupted, and the disturbances continued through the murre chick-rearing period into late June and July. This is in contrast to previous years when disturbance by eagles was greatly reduced after mid-June, and more localized on the north end of Colony Rock. **A new predator of murre eggs that created the second greatest number of disturbances (11%) was Turkey Vultures (*Cathartes aura*)**. 2011 is the first year that Turkey Vultures were observed disturbing the colony during the murre breeding season. **Disturbance by California Brown Pelicans (*Pelecanus occidentalis*) was also much greater in 2011 than in 2010 (the first year pelicans were observed eating murre chicks)**. Pelicans actively pursued and consumed murre chicks and caused general disruption of breeding murres by roosting, flapping and walking through the colony. During 372 hrs of observation, we witnessed 186 disturbance events where 1034 eggs, 142 chicks, and 70 adult murres were taken (Table 1). Depredation rates were three to ten times higher than in previous years. Unobserved disturbance during the early season (before egg laying) does appear to affect lay dates and, again this year, no chicks (murres or cormorants) were reared on the headland itself, likely due to predator disturbance (avian or mammalian).

During the past five years, murre diets have varied annually. The dominant species consumed in 2011 included smelt (Osmeridae), flatfishes (Bothidae or Pleuronectidae), Pacific sand lance (*Ammodytes hexapterus*), and Pacific herring or sardine (Clupeidae; Fig. 6). Other prey species included northern anchovy (*Engraulis mordax*), surfperch (Embiotocidae), rockfishes (*Sebastes* spp.), squids (*Loligo* sp.), cod (Gadidae), and sculpin (Cottidae). **A notable difference in diets among the past five years was the dominance of sand lance in 2008, and the dominance of smelt in 2010, and the increased consumption of flatfishes in 2011(Fig. 6). Rockfishes were most abundant in diets in 2008 and 2010.**

For a second year we also conducted four full-day chick provision rate watches. Observers recorded the frequency that adult murres were delivering food to chicks at selected nests. Chick feeding rates (also foraging trip duration) are a good overall measure of food availability and will be a valuable metric to compare among years. We also collected feathers of beach-cast murre chick carcasses for stable isotope analyses of diet composition and nutrient sources. These samples will be processed and analyzed this winter.

Summary and Future Directions – Project Integration

The dramatic increase in predator disturbance in 2011 was not unique to YHONA. There were similar reports of greatly increased predator activity (bald eagles) causing extensive reproductive loss at other seabird colonies on the northern Oregon coast. It may be that the cause(s) leading to this increased predator activity at seabird colonies in 2011 are larger, regional-scale factors affecting predator distribution or their alternative prey. While it is quite obvious that predators greatly reduced murre reproductive success at YHONA this year, foraging conditions for murres also seemed to be suboptimal at times. For example, the increased occurrence of flatfishes in murre

diets, especially during a few weeks of the chick-rearing period, may have indicated murres were having a difficult time finding other, better quality prey. Juvenile flatfishes are generally considered suboptimal for feeding young murre chicks. The murre diets reflected more warm water associated smelt in 2010 vs. cooler water associated sand lance (and fewer smelt) in 2011, which is consistent with El Nino vs. La Nina influenced summers, respectively.

We will continue this study in 2012 with the ultimate goal of establishing long-term monitoring at this site. New studies in 2012 will focus on early season (pre-incubation) impacts of murre predators and comparing these impacts at a colony on the southern Oregon coast where their appears to be less eagle disturbance vs. northern Oregon where there appears to be more. We also will test remote camera monitoring equipment, in part, for predator surveillance during all daylight hours. If proven successful this will enhance our data collection opportunities as well as provide an excellent public education and outreach tool.

Long-term research and monitoring efforts at YHONA will be particularly valuable given the abundant and diverse group of seabirds and the close proximity to oceanographic research and monitoring stations. These include the Newport Hydrographic Line (sampled twice monthly at stations 1-25 nm offshore) and a wide array of other research conducted by NOAA Fisheries and Oregon State University, including the planned cabled ocean observing system (the Endurance Array http://www.whoi.edu/page.do?pid=29616 & http://www.nanoos.org/about_nanoos/intro.php).

In the News

Nancy Steinberg, a local science writer, published a very nice article on our studies at YHONA in the December 2011 issue of Oregon Coast Magazine. http://www.northwestmagazines.com/Epubs/Oregon_Coast_November_December_2011/#?page=26

Acknowledgements

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Table 1. Preliminary summary metrics from studies of Common Murres at the Yaquina Head colony, 2007-2010.

	Observation			Hatch Date					Predation Rate # per hour[c] (total #)		
Year	Hours	Days	# plots	1st	Med	Hatching success[a]	Reproductive success[b]	# disturbances	Egg	Chick	Adult
2007	149	30	11[d]	6/20	6/27	0.70 (± 0.05 SE)	0.54 (± 0.07 SE)	23	0.21 (32)	0.00 (0)	0.06 (9)
2008	117	35	11[d]	6/10	6/23	0.86 (± 0.04 SE)	0.77 (± 0.05 SE)	20	0.21 (25)	0.00 (0)	0.04 (5)
2009	140	53[f]	10[e]	6/17	6/24	0.86 (± 0.03 SE)	0.77 (± 0.04 SE)	27	0.36 (50)	0.00 (0)	0.04 (6)
2010	223	56	11[d]	6/24	7/8	0.87 (± 0.04 SE)	0.68 (± 0.04 SE)	20	1.07 (239)	0.04 (10)	0.00 (0)
2011	372	79	11[d]	6/28	7/8	0.36 (± 0.07 SE)	0. 22 (± 0.05 SE)	186	3.32 (1034)	0.38 (142)	0.19 (70)

[a]Chicks hatched per eggs laid (mean among plots)

[b]Chicks fledged (≥15 days old) per eggs laid (mean among plots)

[c]Total # observed taken/total # observation hours

[d]Two adjacent plots (CR5 & CR6) were combined because of a low number of visible eggs to follow

[e]Two sets of adjacent plots (CR2 & CR3, CR5 & CR6) were combined because of a low number of visible eggs to follow

[f]Thick fog limited observations to very short time periods or prevented observations altogether during some days in July – much more so than in previous years.

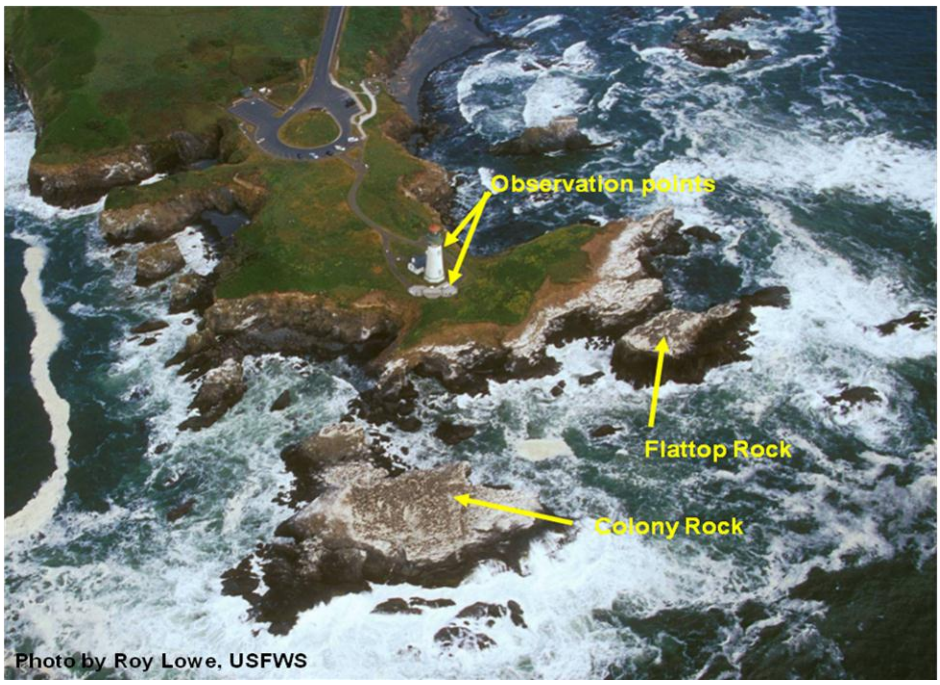

Figure 1. Study plots on Colony and Flattop Rocks.

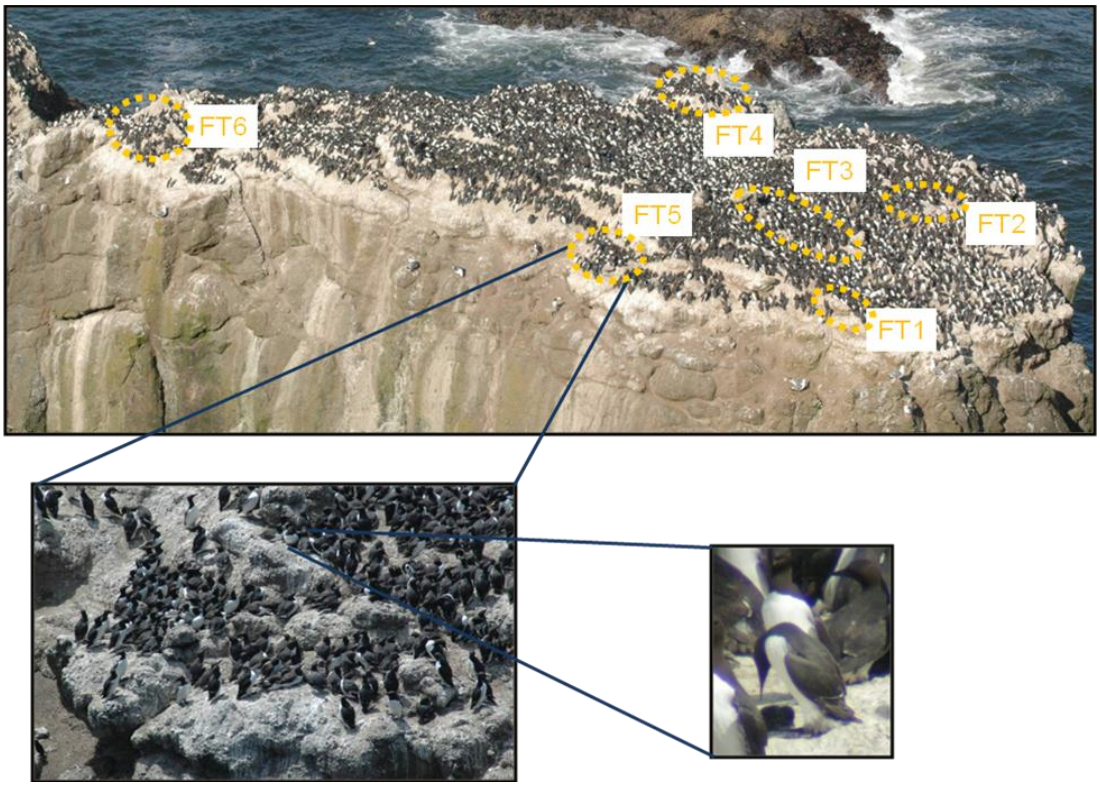

Figure 2. Close-up of Flattop Rock, plot #5, and an adult with a young chick

Figure 3. Digiscoping techniques for photographing and identifying forage fish delivered by adult murres to feed their chicks on the colony.

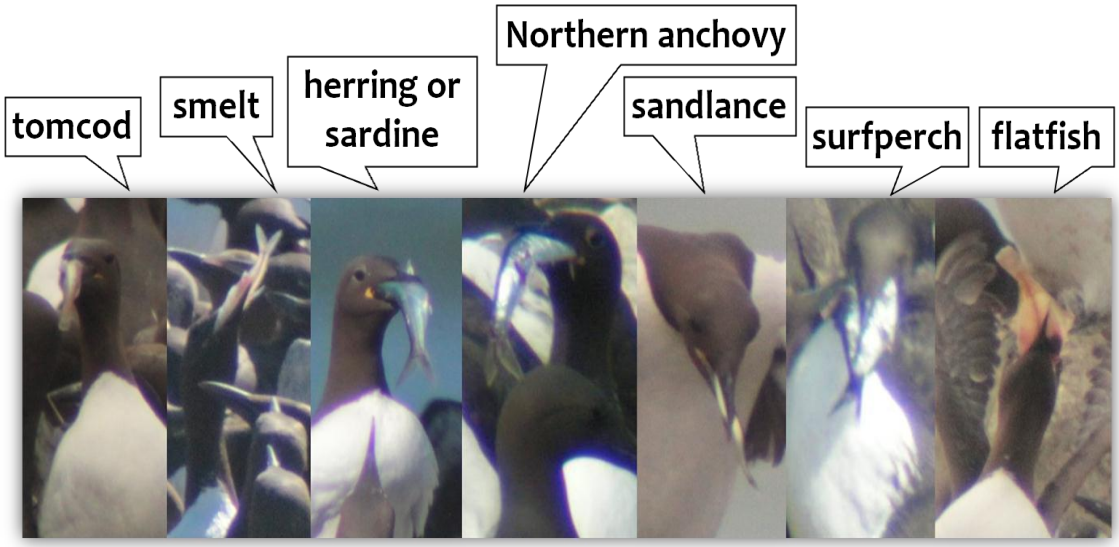

Figure 4. Prey photos taken from the observation deck at the base of the lighthouse.

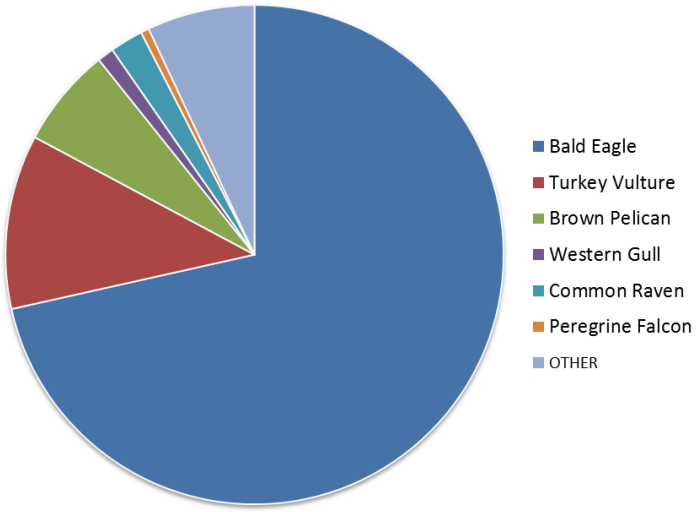

Figure 5. Sources of disturbance to Common Murres at Yaquina Head in 2011. A total of 186 disturbances were recorded, **three times as many as the previous 4 years combined.** Turkey Vultures were a previously unrecorded source of disturbance at Yaquina Head, but accounted for 11% (21) of the disturbances in 2011.

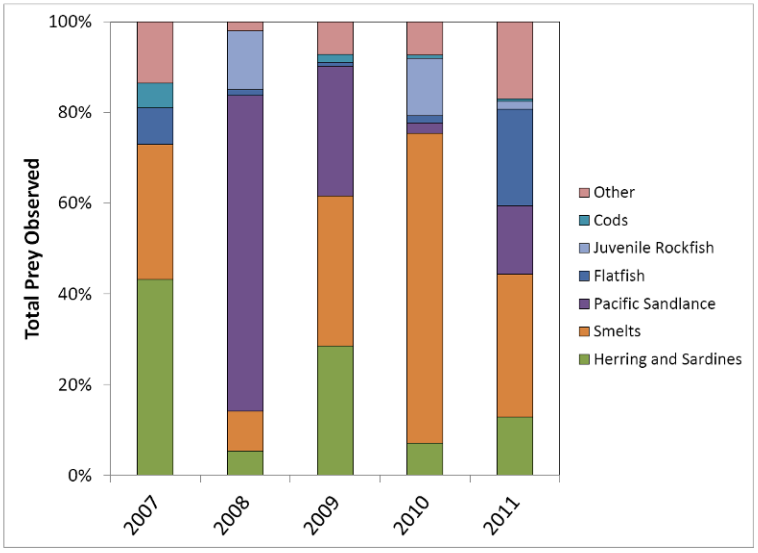

Figure 6. Diets of Common Murres (% occurrence) during 2007-2011. 2008 stands out as a remarkable year for sand lance consumption, 2010 for smelt, and both of these years for rockfish. 2011 is notable for an increased consumption of flatfishes.